

IN THE CLAIMS:

Please amend claims 3-5 as follows:

1-2. (Cancelled)

3. (Currently Amended) A method of manufacturing a substrate of a rotary encoder, comprising:

(a) an etching step comprising etching a resin substrate, in which metal foil is bonded to its front surface and back surface so as to form first and second ring-shaped electrode patterns provided concentrically around a center hole, and a third ring-shaped comb electrode pattern on an outermost periphery as electrode patterns;

(b) a plating step comprising metal-plating the ~~[[three]]~~ first, second and third electrode patterns of said resin substrate;

(c) a resin varnish applying step comprising applying and surprinting resin varnish into a concave portion of the third ring-shaped comb electrode pattern after the etching, ~~so as to remove and removing~~ excessive resin varnish from the surface of the concave portion of the third ring-shaped comb electrode pattern;

(d) a resin varnish curing step comprising heating and compressing said resin substrate so as to cure the resin varnish surprinted into the concave portion of the third ring-shaped comb electrode pattern; and

(e) a polishing step comprising polishing and removing the excessive varnish remaining on the metal surfaces of the electrode patterns so as to flatten the surfaces of the electrode patterns.

4. (Currently Amended) A method of manufacturing a substrate of a rotary encoder, said rotary encoder comprising:

(i) a resin substrate having:

(a) a front surface having an outermost periphery,

(b) a back surface opposite the front surface;

(c) a [[front]] center hole protruding through said substrate, from the front surface to the back surface, and within the outermost periphery,

~~a back surface, an outermost periphery,~~

(d) first and second ring-shaped electrode patterns formed on the front surface of the substrate, concentrically around the center hole, and

(e) a third ring-shaped comb electrode pattern ~~without a difference in level~~ formed adjacent [[an]] to, and level with, the outermost periphery of the front surface of the substrate, and

(f) wiring patterns covering the electrode patterns through each of three external connecting terminals provided on the outermost periphery on the front surface or back surface of said substrate;

(ii) a case having:

(a) an open end,

(b) an upper surface opposite the open end;

(c) edges adjacent said open end; and

(c) a circular hole formed in a center of [[an]] the upper surface thereof,

said case being secured to the substrate at the edges of the open end of the case;

(iii) a shaft rotatively inserted through the circular hole of said case, so as to to be supported thereby, a lower end shaft portion of said shaft further being rotatively inserted into the center hole of said substrate;

(iv) a gear-shaped rotor supported by a bottom surface of said shaft in said case, said rotor having an outer periphery, being rotated simultaneously with and by said shaft;

(v) a click mechanism capable of elastically displacing a ball bearing subject to elastic pressure exerted by a plate spring provided in said case into a concave portion on the outer periphery of said rotor, so as to regulate a rotating angle of said shaft; and

(vi) a first slider, affixed to a lower surface of said rotor, for electrically connecting the first ring-shaped electrode pattern and the third ring-shaped comb electrode pattern, and

(vii) a second slider for electrically connecting the second ring-shaped electrode pattern and the third ring-shaped comb electrode pattern,

said first slider and said second slider outputting pulse signals with different phases,

said method comprising:

(1) an etching step comprising etching a resin substrate, in which metal foil is bonded to [[its]] front surface and back surface of the resin substrate so as to form first and second ring-shaped electrode patterns having metal surfaces provided concentrically around the center hole and the ring-shaped comb electrode pattern having a metal surface on the outermost periphery as electrode patterns;

(2) a plating step comprising metal-plating the [[three]] first, second and third electrode

patterns of said resin substrate;

(3) a resin varnish applying step comprising applying and surprinting resin varnish into a concave portion of the third ring-shaped comb electrode pattern after the etching, ~~so as to remove and removing~~ excessive resin varnish from the surface of the concave portion of the third ring-shaped comb electrode pattern;

(4) a resin varnish curing step comprising heating and compressing said resin substrate so as to cure the resin varnish surprinted into the concave portion of the third ring-shaped comb electrode pattern; and

(5) a polishing step comprising polishing and removing the excessive varnish remaining on the metal surfaces of the electrode patterns so as to flatten the surfaces of the electrode patterns.

5. (Currently Amended) A method of manufacturing [[[]]]a substrate of a rotary encoder comprising:

(i) a resin substrate having: ~~a front center hole~~;

(a) a front surface having an outermost periphery;

(b) a back surface opposite the front surface, said back surface having an outermost periphery, ~~an outermost periphery~~;

(c) first and second ring-shaped electrode patterns formed on the front and/or back surface of the resin substrate, concentrically around the center hole, [[and]]

(d) a ring-shaped comb electrode pattern ~~without a difference in level~~ formed adjacent [[an]] to, and level with, the outermost periphery of the front surface of the resin

substrate,

(e) wiring patterns covering the electrode patterns through each of three external connecting terminals provided on the outermost periphery ~~[[on]]~~ of the front surface or back surface of said resin substrate;

(ii) a case having:

(a) an open end,

(b) an upper surface opposite the open end;

(c) edges adjacent said open end; and

(d) a circular hole formed in a center of ~~[[an]]~~ the upper surface ~~thereof~~,

said case being secured to the substrate at the edges of the open case;

(iii) a shaft rotatively inserted through the circular hole of said case, so as to ~~[[to]]~~ be supported thereby, a lower end shaft portion of said shaft further being rotatively inserted into the center hole of said resin substrate;

(iv) a gear-shaped rotor supported by a bottom surface of said shaft in said case, said rotor having an outer periphery, and being rotated simultaneously with and by said shaft;

(v) a click mechanism capable of elastically displacing a ball bearing subject to elastic pressure exerted by a plate spring provided in said case into a concave portion on the outer periphery of said rotor, so as to regulate a rotating angle of said shaft;

(vi) a first slider, affixed to a lower surface of said rotor, for electrically connecting the first ring-shaped electrode pattern and the third ring-shaped comb electrode pattern~~[[, and]]~~;

(vii) a second slider for electrically connecting the second ring-shaped electrode pattern

and the third ring-shaped comb electrode pattern,

said first slider and said second slider outputting pulse signals with different phases;

(viii) a switch board having a circular conductor pattern on a center of ~~[[its]]~~ a surface thereof, a horseshoe conductor pattern around the circular conductor pattern and two switch terminals wired on the conductor patterns, respectively, provided on ~~[[a]]~~ the bottom surface of said resin substrate of said rotary encoder; and

(ix) a dome type conductor, having repulsiveness, placed on the conductor patterns on the surface of said switch board;

wherein said shaft is energized to a shaft direction by a spring provided on a bottom surface of said shaft and simultaneously supported to said substrate of said rotary encoder so as to be slidable up and down, and said shaft has a tact switch mechanism for electrically connecting the switch terminals in such a manner that said shaft is pressured in the shaft direction and thus its lower end shaft portion deforms a center portion of the dome conductor on said switch board,

said method comprising:

(1) an etching step comprising etching a resin substrate, in which metal foil is bonded to ~~[[its]]~~ the front surface and back surface of the resin substrate so as to form ~~[[the]]~~ first and second ring-shaped electrode patterns having metal surfaces provided concentrically around the center hole of the front surface thereof, and ~~[[the]]~~ a third ring-shaped comb electrode pattern having a metal surface provided on the outermost periphery of the front surface, as electrode patterns;

(2) a plating step comprising metal-plating the ~~[[three]]~~ first, second and third electrode patterns of said resin substrate;

(3) a resin varnish applying step comprising applying and surprinting resin varnish into a concave portion of the third ring-shaped comb electrode pattern after the etching, ~~so as to remove~~ and removing excessive resin varnish from the surface of the concave portion of the third ring-shaped comb electrode pattern;

(4) a resin varnish curing step comprising heating and compressing said resin substrate so as to cure the resin varnish surprinted into the concave portion of the third ring-shaped comb electrode pattern; and

(5) a polishing step comprising polishing and removing the excessive varnish remaining on the metal surfaces of the electrode patterns so as to flatten the surfaces of the electrode patterns.